The influence of age, sex and socioeconomic status on incidence and outcome of hip fracture

For this project, we sought to determine the influence of age, sex and socioeconomic status on incidence and outcome of hip fractures in the UK population by conducting a review of existing literature.

Aims:
- To determine the effects of age and sex on the incidence of hip fractures
- To determine the effects of age and sex on outcome following hip fractures
- To determine the effect of socioeconomic status on incidence of hip fractures
- To determine the effects of socioeconomic status on outcome following hip fractures

We also considered the influence of different types of hip fracture on outcome, as this could have implications for research into the effect of social factors.

Introduction

For the past few decades, Scotland and the rest of the UK have been experiencing the phenomenon of an aging population. This demographic shift has placed an increasing burden on the NHS to manage the health consequences of citizens living to an older age. Hip fractures are one such consequence. In information presented to the Scottish Parliamentary Finance Committee, the National Osteoporosis Society suggested that “projections show… by 2036 there could be as many as 19,000 hospital admissions for hip fracture per year in Scotland” - a 43% increase on 2008 admission statistics [1]. It remains a very current topic, with multiple factors contributing to an individual’s risk of suffering from a hip fracture.

A hip fracture can be defined as a break in the upper quarter of the femur [2]. The mechanism and resulting damage to the area is not identical in every case however, and fractures can be largely divided into two main sub groups: intracapsular and extracapsular fractures. The capsule is the strong fibrous sleeve covering the joint of the hip, running from the acetabular margin to the intertrochanteric line [3]. The capsule also contains fluid that lubricates and nourishes the hip joint and bears an important relation to the blood supply of the hip. Blood is supplied to the hip joint from the medial and lateral circumflex femoral arteries, branches of the profunda femoris and femoral arteries. Insertion of these arteries is at the capsule. A break in the neck of the femur can disrupt this blood supply, which can ultimately result in avascular necrosis of the hip joint.

Intracapsular fractures occur in the area of the neck and head of the femur [2] (see Figure 2). Extracapsular fractures occur outwith the capsule and can be divided into further sub-categories. Intertrochanteric fractures are where the line of the fracture is between the greater and lesser trochanter (see Figure 3). In subtrochanteric fractures, the line of the fracture spreads distal to the trochanters and the femoral neck remains intact [4].
For many of the 61,508 patients admitted to a UK hospital (excluding Scotland) between 1 April 2012 and 31 March 2013, age and age related factors (e.g. osteoporosis and sex) will have been significant indicators of a high fracture risk [5]. One factor that would appear to have a less obvious impact on a person’s risk of suffering a hip fracture is socioeconomic status. Socioeconomic factors that indicate a healthy ageing process, e.g. few comorbidities, appear to lower the risk of an individual suffering a hip fracture [6]. Socio-economic status also has an influence over the outcome for patients following the injury.

Therefore, we will go on to consider the factors that are related to an individual’s risk of suffering a hip fracture; including age, sex and socioeconomic status; and also how these factors, as well as the type of hip fracture suffered, affect the outcome of the fracture.

The Influence of Age and Gender on Incidence of Hip Fracture

A study by Osteoporosis International [7] suggested a positive correlation between increasing age and hip fracture incidence. This is an accepted relationship in literature [9,10,12]. However this particular article collated data from many different European countries, and varying levels of reported data could affect their findings. It has been suggested that there is an almost exponential increase in fracture incidence at approximately 65-70 years old [8].

Another study conducted by Osteoporosis International found that women were three times more likely to fracture their hip compared to men [9]. Such figures can be attributed to osteoporosis being far more prevalent in older women than in men of the same age [10]. Osteoporosis is primarily a disease of the elderly; it involves the gradual loss of bone density, which is commonly associated with ageing. It also affects postmenopausal women the most due to hormonal changes following the menopause [10] (see Figure 4). This explains why the highest incidence of hip fractures occurs in elderly women.

By isolating these common risk factors, steps can be taken to introduce preventative measures against hip fractures and therefore decrease their incidence. Educating groups associated with the aforementioned risk factors to exercise care in order to reduce the incidence of hip fractures could lead to positive results regarding health promotion. This is due to the proportion of hip fracture patients being so concentrated in one social demographic – postmenopausal women.

The Influence of Age and Gender on Outcome following Hip Fracture

Although the incidence of hip fracture increases with age in both men and women, the outcome following a hip fracture differs.

Sustaining a hip fracture increases risk of mortality, and recovery of functionality to any considerable degree is restricted to around 50% of patients. The long term impact on both physical and mental health is significant with roughly 25% of hip fracture patients requiring long-term residential treatment [10].
A study conducted in Switzerland [11] found that for the same age, mortality rate after hip fracture was higher in men than in women. Although the reduction in life expectancy was similar in both genders, the proportion of life lost was higher amongst males, suggesting a worse impact of hip fracture survival. The reasons for this higher mortality are due to comorbidity. It is also known that male life expectancy is approximately 7 years lower than females in the general population [12].

Another study conducted in Sweden [12] reinforced these findings, showing that despite males being four years younger on average when the hip fracture occurred, there was a substantially higher mortality rate compared to women. They found, however, that this excess mortality cannot be explained by controlling for known comorbidity and medications. It was found that higher age and multi-morbidity are directly related to a higher risk of mortality within 12 months of fracture.

Holt et al. [13] found that 96% of patients over the age of 95 required permanent institutional care, and that the possibility of recovery was severely limited. The mortality rate was also very high, with 36% of patients dying within 14 days. This suggests that increasing age in both men and women decreases likelihood of a fair or good outcome.

Advancing age is closely associated with increased mortality after hip fracture. Patients over the age of 85 are much more likely to die during the first year after hip fracture [11].

It can therefore be concluded that increasing age leads to detrimental outcomes for both males and females. On average, the outcome for men of all ages is worse than that for women, represented by both higher mortality rates and increased rates of institutionalised care.

**Socioeconomic Status: Definitions and Measurement**

The interplay between socioeconomic status (SES) and health is a subject which dominates epidemiological research. Before considering the association between SES and the incidence and outcome of hip fractures, it is important to define this rather ambiguous concept and discuss the challenges that are faced in its measurement.

Socioeconomic status is difficult to define. It is complex, dynamic and multidimensional, encompassing both individual and collective characteristics, including income, wealth, educational attainment, access to services and occupation [14]. SES is dependent on an individual’s alignment with expected and desired social standards [15], making it highly subjective. This notion of SES as a relative concept, dependent on accepted social norms and the status of other members of society, underpins its definition and use in health research [15, 16, 17, 18]. The measurement of such an ill-defined and subjective notion is a major challenge in research.
Conclusions of epidemiological research can vary considerably depending on the methods used to measure SES [14, 19]. Methods used to quantify and compare SES include the use of single indicators (e.g. income, wealth, and education), composite measures (e.g. wealth and education) and contextual measures which examine shared exposures within a particular social environment (e.g. IMD 2000) [19]. The precision and validity of such approaches is the subject of ongoing debate.

The Index of Multiple Deprivation (IMD) 2000 is considered one of the most reliable ways to measure SES [20] and was popular among studies used to compile this review. It is, however, considered simplistic and imprecise by critics [20]. It is a contextual measure which determines the social class of a geographical area according to six domains: average income, employment rates, health and disability, educational attainment of residents, housing quality and access to services [20]. When applying this measure in research, the SES of each participant is taken to be the calculated value for his/her area of residence. IMD 2000 therefore grossly generalises residents in each area and cannot be assumed to represent individual patients. By taking a cross-sectional approach, it ignores the dynamic nature of SES and the duration of deprivation, thus disregarding the role of SES throughout the life course. This criticism is particularly persuasive because low SES in childhood has a bearing on adult health irrespective of SES in adulthood [14,21]. The problems with the measurement of SES appear endless and must be considered when reviewing its association with hip fractures.

It is important to note that although SES is often used interchangeably with “poverty” and “deprivation”, these phrases have very different definitions. Poverty is simply lack of food and shelter [22]. Deprivation is also dependent on material possessions but relates more specifically to how a lack of resources impacts involvement in society [15, 22]. The confusion of these three terms made it difficult to conduct a comprehensive literature search on this topic.

**The Influence of Socioeconomic Status on Incidence of Hip Fracture**

It is well established in literature that socioeconomic factors indicative of a healthy ageing process are protective for fall-related hip fracture in older people [24, 25, 26]. As hip fractures have such debilitating consequences, it is important to identify modifiable behaviours which increase the risk of hip fracture, and promote protective attitudes towards lifestyle factors. Socioeconomic factors which have been identified as risk factors for fall-related hip fractures include; smoking, high alcohol intake, low household income, low education level, fellow household residents and household type [24, 25, 26].

**Smoking**

Patients who have never smoked, or have given up for a period of more than ten years, have a decreased risk of fall-related hip fracture compared to those patients who do smoke; those who had never smoked had an odds ratio of 0.27 and those who had given up for a period of over 10 years had an odds ratio of 0.36 [25]. Smoking has a detrimental effect on hip fracture risk as it increases the rate of bone loss, and reduces the rate at which calcium is absorbed from the small intestine [26]. Increasing time since cessation is
inversely associated with the rate at which bone is lost, and hence smoking cessation reduces risk of fall-related hip fracture [26]. The longitudinal, case-controlled nature of this study, proves a temporal relationship, making the link between smoking and bone loss more reliable.

Similarly, Hoidrupa et al. [24] looked at the detrimental effect of smoking upon hip fracture risk, rather than just the protective effects of not smoking. Odds ratios for smokers were adjusted for potential confounders and the resultant ORs were found to be 1.36 for women and 1.59 for men relative to the control group of non-smokers. This shows an independent correlation between smoking and hip fracture risk, irrespective of gender - differences in gender were found to be insignificant.

Alcohol

Alcohol consumption has been extensively investigated in its link to osteoporotic fractures, specifically hip fractures. However, Berg et al. [27] noted that, in moderate quantities, alcohol can have a mildly protective effect against fall-related hip fractures. When compared to non-drinkers, people who had up to 0.5 drinks per day had an odds ratio of 0.84 and those who drank between 0.5 and 1 drinks per day has odd ratio of 0.80, highlighting the potential protective effects [27]. However, consuming more than 2 drinks per day resulted in a greater risk of sustaining a hip fracture, with an odds ratio of 1.39. The latter statistic could be as a result of the linear relationship between alcohol consumption and decreased bone mineral density [27], leading to a greater chance of sustaining a fracture as well as increased risk of drunk-related traumas and vehicle accident [28]. A study has found that a large alcohol intake over a sustained period of time increases the risk for hip fracture in women by 18%, and in men by 45% [29].

Household

There are a number of studies [29,30,31] that look at the personal factors which could contribute to an individual’s risk of suffering a fall-related hip fracture including: marital status, duration of living within a household, emotional status and ability to cope with stress, life satisfaction and social integration. Holmberg et al. [29] demonstrated that living alone significantly increases a person’s likelihood of suffering a hip fracture in their study detailing the risk of hip fractures in 33,000 men and women. This study had a very large sample size which reduced the risk of chance on the results, which makes the results much more reliable. These factors can then be sub-categorised into: being married, living with others and living on one’s own. Being married has a protective effect (OR=0.37), and living with others a slightly less protective effect (OR=0.58). This is due to the fact that living alone represents an increased exposure to several harmful behaviours such as: poorer diet, lower levels of physical activity, increased intake of medication and smaller social network. Marriage has been associated with healthy behaviours in both men and women, and so there is a decreased risk for the people who are married compared with those who are single, widowed or divorced [29]. However, it is important to note that it is only the recent marital status that is a factor, not overall marriage history — so even though someone may have been married, if this is no longer the case then they do not experience the same protective effects [30]. Furthermore, the length of stay in a dwelling was correlated with the risk of hip fracture as people who had spent more than five years in
their current dwelling had an odds ratio of 0.43 showing the protective effect of a “home”, and suggests a link between personal stability and a decreased risk of hip fracture [30].

Patients who do not lose weight in middle to older age are found to have a decreased risk of fall-related hip fractures (OR=0.36) [31]. It has been established [30] that weight loss in middle to old age is a risk factor for hip fracture, as weight loss is an indicator for fragility and an indicator of poorer health, low activity and poor nutrition. In a study ascertaining the relationship between weight loss and hip fracture risk, women who suffered a fall-related hip fracture had a younger maximum weight age than a non-hip fracture group [31].

In terms of society, there are some important factors that have a protective effect against fall-related hip fracture. For example, people who have a greater social integration were seen to be more protected against hip fracture than others (OR=0.43). Indeed, those elderly people who took part in social activities had a significant protective effect against hip fractures (OR=0.28) [31].

Income

When looking at women with a higher household income who have been gainfully employed for over two decades, a study conducted by Farahmand et al. [30] reported that they have a decreased risk of sustaining fall-related hip fractures compared with women who are unemployed. The study also shows that women who are gainfully employed have a 0.64 OR compared with women who are unemployed, and that those with a high household income have a 0.86 OR in comparison with those who come from low income backgrounds.

Another study by Langlois et al. [32] produced similar results, demonstrating that areas with a higher annual income in Oslo, Norway, have a lower incidence of hip fractures compared with the incidence of lower socioeconomic areas. This was found to be the case in both men and women, illustrating the significance of socioeconomic status compared with gender.

The occupation of the patient is also significant as it has been found that weight-bearing and muscle loading activities may reduce the risk of fractures. Therefore those with active occupations, such as factory workers and nurses, have a reduced risk of hip fracture compared to those who have a sedentary job, such as office workers [31].

A low income can also lead to poor nutrition as, increasingly, fast food and unhealthy options are becoming the preferred option due to convenience and less education about healthy eating. There are low-cost, healthy options available in the market but many people in these low SES areas do not know where to source these and, quite often, how to use the low-cost ingredients to make a meal. This poor nutrition stemming from low income and poor health-education can lead to a calcium and/or vitamin D deficiency, which are both vital for strong and healthy bones, causing a low bone mineral density and increasing the risk of osteoporotic hip fractures [32].
**Education**

Lower education levels are associated with decreased socioeconomic status, and low education levels have been linked to an increased risk of sustaining a hip fracture [33]. However, the study carried out by Farahmand et al. [30] contradicts this statement as they found that there was no difference in the hip fracture risk depending on either low, medium or high levels of education.

A prospective study carried out by Sewell et al. [34] indicates that those without a high school diploma have a 2.1 OR in reference to those who went to university, highlighting the possible correlation between a low education level and increased hip fracture risk. However, there are varied results on this topic. Therefore, it can be suggested that as lower education levels are associated with a lower socioeconomic status; other, more significant, factors such as poor nutrition, increased alcohol intake and smoking are contributing to increased risk of hip fracture. Essentially low education level is just a by-product of the low SES.

**The Influence of Socioeconomic Status on Outcome following Hip Fracture**

According to the National Institute for Health and Care Excellence, the three main proxy indicators of patient outcome following a hip fracture are return to usual residence, mobility change and mortality. [35]

**Accomodation**

For someone who has sustained a hip fracture, one important outcome is the type of accommodation that they are discharged to. Ideally, the patient will return to the same housing situation they were in prior to the fracture. A change in the category of accommodation suggests that there is a crucial change in the patient's functional ability as well as in their health status.

In a prospective study looking at patients in Nottingham between 1999 and 2009, only 56% of patients who were admitted from their home returned there following treatment [36]. Predictive factors for returning to previous accommodation are widely accepted to be age, cognitive status and number of comorbidities [11]. No trends were seen in relation to socioeconomic status [36].

In the United States, 14% of patients are discharged to their homes and 58% are discharged to a nursing facility. Of these 58%, 49% are at home at 90 days and 96% are home at 180 days. Patients with only a secondary school education, indicative of lower SES, were more likely to be transferred to inpatient rehabilitation rather than a nursing facility [37].

**Mobility Change**

According to the National Hip Fracture Database 2011 national report, approximately half of all hip fracture patients do not return to their pre-fracture level of mobility [35]. In the
American study previously referred to, those in the highest income group saw less decline in mobility, large muscle and gross motor skills [37].

**Mortality**
Overall, mortality in patients who have sustained a hip fracture is high, even though a decrease in 30-day mortality has been seen more recently (from 9.4% of patients in 2008/2009, to 8% in 2010/2011) [35]. In comparison, an American study found in-hospital, 6-month and 1-year mortality to be 2.7%, 19% and 26% respectively [37]. Although relatively little is known about the association between socioeconomic status and mortality following hip fracture, a study conducted in Nottingham found that there is no significant difference in mortality between patients of differing socioeconomic status [36]. On the other hand, another study conducted in England did show a higher in-hospital mortality rate in the most deprived patients when compared to the least deprived [38]. Similarly, a recent study in Rome, Italy which also has a National Health Service that aims to provide equal healthcare to all, showed that those of a lower socioeconomic status had an increased 30-day mortality compared to those of a higher socioeconomic status [39].

When looking at mortality at one, three, five and seven years, the English study previously referred to demonstrated a significant increase in mortality in the least deprived patients when compared to the most deprived patients [37].

**Hospital stay**
During the aforementioned Nottingham study, patients’ mean length of stay in hospital was 21.5 days. No relationship was found between length of hospital stay and socioeconomic deprivation [36].

It is worth mentioning that the American study discussed here had several weaknesses, most importantly a very small study size, which calls into question the reliability of its findings.

**The Effect of Different Types of Hip Fracture on Outcome**
As well as the social factors discussed previously, the type of hip fracture that a patient suffers can also have a great impact on their chance of survival and the extent of their return to normality. Compared to the other factors, there is little literature from the last 10 years concerning the differences in outcome. However, there have been some large, detailed studies conducted within the last 20 years which highlight some differences between the two fracture types.

Overall, patients who suffered from an intertrochanteric fracture had a better prognosis than those who suffered from a subtrochanteric fracture [40]. In part, this can be attributed to the anatomy of the two fracture regions. The intertrochanteric region contains large volumes of cancellous/trabecular bone. This type of bone is the location of the red bone marrow responsible for haematopoiesis as well as other regenerative functions. It has the benefit of a rich blood supply and fractures in the region therefore generally heal well, provided the fracture is treated correctly. The major complication that fractures of this type
present with is pulling on the greater trochanter causing displacement of the fracture following fixation due the action of the iliopsoas, major external rotator and abductor muscles of the hip. Avascular necrosis of the femoral head, due to malunion of the bone, is also a risk with this type of fracture due to the anatomical location [40].

The blood supply to the area around the neck of the femur is in direct contrast to that of the intertrochanteric region of the femur. The femoral neck has little cancellous bone, a blood supply which is easily disrupted after fracture, and a thin periosteum (the dense connective tissue surrounding the bone). Avascular necrosis of the bone in this area and degenerative changes of the femoral head are major complications that can arise as a result of these type of fractures [41].

A 2010 review by Johnston et al. [41], conducted following the 2008 Scottish Hip Fracture Audit, demonstrated that patients with an intracapsular fracture have significantly higher survival rates than those with an extracapsular fracture. This can usually be attributed to the fact that more elderly patients suffer from the latter kind of fracture. However this study aimed to remove age as a confounding factor by using standardised mortality rates, and still found that patients who suffered from intracapsular fractures had better rates of survival. This study attributes this to the fact that patients who suffer from extracapsular fractures tended to have a greater number of co-morbidities.

In a 1996 USA study, Fox et al. [42] had similar findings. Here patients who suffered from an extracapsular intertrochanteric fracture were more likely to be in poor health pre fracture, as well as being older. In contrast however, Cornwall et al., in a 2004 study, found that patients who suffered from an intracapsular displaced femoral neck fracture were more likely to suffer from a coexisting cardiovascular disease than patients who suffered an extracapsular stable or unstable intertrochanteric fracture. This was also the case for neurological co-morbidity (e.g. Dementia) [43]. There was no difference in the presence of renal conditions, COPD, cirrhosis or delirium amongst patients however. The greater scrutiny of co-morbidities and difference in study exclusion/inclusion criteria could be responsible for this slight difference. Another US study conducted in 1996 by Koval et al. [44] conducted on 680 patients found no relationship between the number, type, or severity of medical co-morbidities in any of their patients.

The type of fracture a patient sustained also had an impact on their functional recovery following their fracture. More function tended to be maintained in patients who suffered from an intracapsular fracture. Patients had higher overall locomotion, transfer and self-care Functional Independence Measure scores (FIM) than patients who suffered from intertrochanteric extracapsular fractures. Within the extracapsular group of fractures, patients who suffered from unstable intertrochanteric fractures had worse locomotive FIM scores than patients who suffered from stable intertrochanteric fractures [42]. The Johnston et al. review, using slightly different assessment criteria for self-care, observed that 30% of patients who suffered from an extracapsular fracture needed to be placed in residential care, compared to 10% of intracapsular patients. Interestingly, they observed a greater decrease in mobility in the intracapsular group than in the extracapsular group, and both group required a greater dependence on walking aids [41].
Each type of fracture also has a unique operative treatment to repair the damage. Both types of fracture are almost always treated surgically, with occasional exceptions for debilitated patients. The preferred surgical treatment for intracapsular fractures is either internal fixation or arthroplasty [40] (see Figure 5). Extracapsular hip fractures are treated with a sliding hip screw to reduce the fracture and allow compression in a controlled manner (see Figure 6). Postoperative complications are more common in patients who suffer from extracapsular, unstable intertrochanteric fractures than in displaced intracapsular fractures [42]. However differences between the two fracture types were minimal with relation to major complications, which include life threatening complications such as CNS dysfunction, multiple organ failure, or even death [45].

Most of the studies on this subject are prospective analyses of patients with hip fractures, with the notable exception of the Johnston et al. 2010 review [41] which compared statistics from two databases. This review looked at the outcome of 30,479 fractures belonging to 29,314 patients, compared to all 3 prospective analyses which all had sample sizes under 1000 patients due to the nature of their study design.

Taking the above into consideration, the most useful paper was the 2010 Johnston et al. review [41], as it was conducted within Scotland, considered the largest number of patients and had very clear and well-defined category assignment. The other 3 US studies [42,43,44] had a largely similar design and had very little variation in findings. The classification method used by Cornwall et al. [43], blinding orthopaedists to both outcome and treatment of the fracture in the radiographs presented to them, controls for selection bias (in this case assigning to categories) which makes findings in this study slightly more reliable.

In conclusion, outcome following hip fracture is greatly influenced by the location of the fracture, with extracapsular fractures resulting in poorer prognosis than intracapsular fractures [41]. Of the sub-categories of extracapsular fractures, unstable intertrochanteric fractures appear to have the worst prognosis [42] due to surgical, anatomical complications of the location (namely a poor blood supply delaying healing) and the likely impact of comorbidities. As classification of hip fractures could vary so much between study types, direct comparison between studies, particularly between the Johnston et al. review [41] and the Cornwall and Fox studies [42,43], was particularly difficult. Further dividing extracapsular fractures into stable and unstable intertrochanteric and subtrochanteric fractures did appear to bring out some more key trends in data collected.

The impact of the location of hip fracture is a possible area for further study as there is very little research on this subject, particularly from within the UK. In studies investigating the influence of other factors such as age, gender and socioeconomic status, considering intracapsular and extracapsular fractures separately could shed new light on how the extent of these influences differs with fracture location.
Conclusions

According to the literature, there is a positive correlation between age and hip fracture risk. As age increases so too does fracture incidence, with the steepest increase occurring above 60 years old. Hip fractures typically occur earlier in men than in women, however women are up to three times more likely to sustain a hip fracture than men. The relationships between age, sex and hip fracture incidence can largely be explained by differences in the prevalence of osteoporosis, the most significant risk factor for fracture. Prevalence of osteoporosis increases with age and is more common in females [46].

Hip fractures cause significant suffering and invariably reduce life expectancy. Outcome is worse for males, who have higher rates of mortality and are more likely to require institutionalised care. As expected, outcome and recovery decline with age. 36% of patients over the age of 95 die within 14 days of hip fracture [13].

A high incidence of hip fracture is associated with lower socioeconomic status. This finding is well-reported in the literature and thought to be related a variety of different exposures that are associated with low SES. Such exposures include: high rates of smoking, high rates of alcohol consumption, low levels of social support and social integration, low levels of physical activity, low education attainment, unemployment, sedentary occupations, poor nutrition and lower income.

The relationship between outcome and SES is more of a mixed picture. With such inconsistencies in the literature, it cannot be concluded that there are significant differences in length of hospital stay, mobility or mortality between different socioeconomic groups. SES has very little bearing, if any, on the outcome of hip fracture. For reliable evidence to be established there is a substantial need for further research into this topic.

Limitations and Suggestions for Future Research

Many of the studies used to compile this review did not consider site of fracture in their analysis. Site of fracture has a substantial influence on outcome; with higher survival rates and maintenance of function observed for intracapsular fractures. Treatment protocol and extent of postoperative complications also vary with fracture type. The lack of consideration for fracture type is concerning.

The inconsistencies in the definition and measurement of socioeconomic status also limited this review. Conclusions of epidemiological research can vary considerably depending on the methods used to measure SES [14, 19]. Differences in the methods used to quantify SES were particularly marked between countries (e.g. USA and UK). ‘Poverty’, ‘socioeconomic status’ and ‘deprivation’ were often used interchangeably by authors, making it difficult to draw conclusions relevant to our aims. Further research is required to evaluate current measures of socioeconomic status and to generate an international objective measure.

Relevant research may have been omitted from this review. The use of narrow search criteria (see ‘Information Search Report’) may mean that valuable research was lost. This
was complicated further by the large and variable number of terms used to encapsulate socioeconomic status – including ‘poverty’, ‘deprivation’, ‘social class’ and ‘wealth’ – and hip fracture – such as ‘femoral fracture’, ‘neck of femur fracture’, ‘osteoporotic fracture’ and ‘intertrochanteric fracture’. The literature search was by no means comprehensive and this limited the quality of the review. Inability to access to a number of articles found during literature searching may also have lead to the omission of relevant research.

Not all research used to compile this review will be applicable to current issues in the UK. Data was obtained from the UK, Europe and USA and cannot be assumed to accurately represent the UK context. Particularly when considering the highly subjective and relative notion of SES, the results must be interpreted with caution. Much of the literature used to review the influence of fracture type was old, out-dated and therefore unrepresentative of the current situation. This major limitation highlights a need for UK-specific and up-to-date research to be conducted.

Implications

The demographic shift towards an ageing population presents an alarming challenge to the NHS. An ageing population is associated with an increased burden of disease and need for medical care [47]. A projected rise in the incidence of hip fractures [1] is one such consequence of this demographic shift. Socioeconomic health inequality is another powerful sociocultural force which causes considerable disparities in health status and outcomes in Scotland [48]. With the projected rise in the incidence of hip fractures [1], reviewing the influence of age, sex and socioeconomic status on the incidence and outcome of hip fractures is essential in order to determine which groups are vulnerable to the significant morbidity and mortality associated with this type of fracture. It is hoped that this review will help inform public health decisions, equipping the NHS to counter the effects of the aging population and socioeconomic health inequalities and ultimately minimise both the suffering of patients and the cost to the NHS.
References


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